Self-Efficacy as a Predictor of Adult Adjustment to Sickle Cell Disease: One-Year Outcomes

By: Robert Edwards, Joseph Telfair, Heather Cecil, and Jennifer Lenoci

Edwards, R., Telfair, J., Cecil, H. and Lenoci, J., (2001) Self-efficacy as a Predictor of Adult Adjustment to Sickle Cell Disease: One-Year Outcomes. *Psychosomatic Medicine* 63(5): 850-858.

Article:

Objective: The present study prospectively investigated the role of self-efficacy in predicting disease symptomatology and health services utilization for adult patients with sickle cell disease.

Methods: These data are derived from a 12-month prospective cohort study of African American adults with sickle cell disease. Disease-specific perceptions of coping self-efficacy and indices of disease severity, health care utilization, and psychosocial adjustment were assessed by use of standardized questionnaires administered by trained clinicians.

Results: Perceptions of self-efficacy for coping with sickle cell disease were moderately stable across the 12-month study period. At baseline (N = 147), significant inverse relationships, measured with Pearson correlations, were noted between self-efficacy and the following variables: physical symptoms, psychological symptoms, pain severity, and number of physician visits over the preceding 12 months ($p <$ .01). Similar relationships with self-efficacy were noted at the 1-year follow-up (N = 104) period for measures of physical symptoms, psychological symptoms, and pain severity ($p <$ .01). In multiple-regression models, baseline self-efficacy scores predicted changes over the 1-year study period in physical and psychological sickle cell disease symptomatology. Moreover, changes in self-efficacy from baseline to 1-year follow-up were significantly and independently related to changes in physical symptoms, psychological symptoms, and pain ratings from baseline to 1-year follow-up.

Conclusions: Self-efficacy beliefs among African American adults with sickle cell disease are inversely related to reported disease symptomatology, and these relationships persist across time. Future investigations should examine the mechanisms through which relationships between self-efficacy and adjustment to sickle cell disease are effected, as well as the feasibility and effectiveness of enhancing self-efficacy beliefs as a means of improving adjustment to sickle cell disease.

SCD = sickle cell disease, SCSES = sickle cell self-efficacy scale

Article:

SCD is an inherited blood disorder that affects approximately 50,000 to 65,000 individuals, generally of African descent, in the United States (1). Individuals with SCD are at increased risk for significant health complications as a result of the production of abnormally sickle-shaped red blood cells. Characteristic symptoms of SCD include pain, stroke, anemia, pulmonary dysfunction, and major organ complications (2). The most frequent intractable problem encountered by persons with SCD is painful tissue ischemia that results from vaso-occlusive episodes (3). Areas of reported pain often include the abdomen, chest, low back, joints, and extremities. In addition to physical complications, individuals with SCD are more likely to report emotional and psychosocial difficulties such as depression, anxiety, and social isolation (4, 5). The direct and

indirect costs of SCD treatment are substantial (5), and studies are needed to identify predictors of adjustment to SCD to enhance quality of life and reduce medical costs in this population.

Although the constellation of SCD symptomatology tends to be similar for most individuals with the disease, significant interindividual variability in the reported frequency, intensity, and impact of symptoms also has been noted (5, 6). As a result of this considerable variability in SCD-related physical and psychological symptomatology, many researchers have turned their attention to the investigation of factors that may account for such variability. These studies have concluded that, in general, disease severity and related illness parameters tend to account for little of the variance in SCD adjustment (6–9), which suggests that psychosocial variables may play a more influential role in determining adjustment to SCD (5, 6, 9, 10). In this regard, several studies have found that psychosocial variables such as coping, stress, depression, and worry may relate to SCD adjustment (4, 5, 11). However, this literature is relatively limited, with an emphasis on the role of coping strategies in the prediction of children and adolescents' adjustment to SCD (7, 8, 12). Because most children with SCD now survive far into adulthood (13, 14), researchers need to examine psychosocial factors that affect adjustment to SCD among adults as well as children.

One important psychosocial variable that may influence coping among persons with SCD is self-efficacy (15, 16). Self-efficacy refers to personal judgments concerning one's ability to engage successfully in specific behaviors that lead to specific, desired outcomes. Ample evidence exists concerning the utility of the construct of self-efficacy. In particular, self-efficacy beliefs have been noted to play an important role in adjustment to such chronic conditions such as fibromyalgia (17), arthritis (18), chronic low back pain (19), diabetes (20), cystic fibrosis (21), multiple sclerosis (22), and chronic obstructive pulmonary disease (23). In these studies, higher levels of self-efficacy were associated with reduced physical symptomatology (eg, severity of pain) and improved psychosocial functioning (eg, lower levels of depression, stress, and anxiety). The results of these investigations suggest that high levels of self-efficacy for coping with or reducing disease symptomatology may act as a buffer for individuals with chronic conditions. Although the mechanisms that underlie the positive benefits of self-efficacy for adjustment to chronic illness remain unclear, self-efficacy beliefs may exert their effects, in part, by facilitating positive health behaviors and reducing the impact of stressors associated with a chronic condition (24, 25).

Recent data have suggested that self-efficacy for the management of chronic illness not only influences current levels of symptomatology but also may affect the course of disease across time. In other words, enhanced self-efficacy beliefs at a given time point may be associated with future decrements in disease symptoms and improvements in adjustment. Indeed, longitudinal studies have documented the beneficial effects of enhanced self-efficacy over a period of months or years in such populations as cardiac patients (26), patients with arthritis (27), patients with cancer (28), older adults (29), and patients with fibromyalgia (30). Results from these investigations suggest that higher baseline levels of self-efficacy are associated with fewer physical and emotional problems at various follow-up periods.

Collectively, recent studies indicate that self-efficacy is an important factor in psychosocial and physical adjustment for persons with a chronic medical condition. Thus, the potential utility of the construct of self-efficacy in SCD is evident. To date, however, only four investigations have examined the role that self-efficacy may play in psychosocial adjustment to SCD. In the first study (31), higher efficacy expectations were associated with improved psychological adjustment (operationalized as lower scores on the Symptom Checklist-90, a self-report measure of general distress) in a sample of adults with SCD. In the second study (9), although self-efficacy beliefs were associated with lower levels of distress at the baseline assessment, baseline self-efficacy did not predict psychological adjustment as measured at the 20-month follow-up. In the third study (11), efficacy expectations were inversely associated with the degree of psychopathology in a sample of children with SCD. Although these three studies provide support for the positive relationship of self-efficacy to SCD adjustment, none incorporated use of a psychometrically validated measure of self-efficacy for coping with SCD, because no such measure was available at the time. Furthermore,

measurement of efficacy beliefs was typically accomplished by use of single-item responses, which are less reliable and sensitive than multi-item scales as indices of self-efficacy (32).

Finally, a recent study by our research group (33) tested the reliability and validity of a nine-item scale that assesses self-efficacy for coping with and managing SCD in adults. The SCSES demonstrated good internal consistency and showed significant positive relationships with the related constructs of self-esteem, mastery, and internal locus of control. In addition, we noted inverse relationships between self-efficacy for coping with SCD and such variables as pain severity, SCD-related physical symptoms, and health-care utilization in a sample of adults with SCD. Of the studies that have examined the role of self-efficacy in psychosocial and physical adjustment to SCD, only the most recent (33) used a psychometrically validated, disease-specific measure of self-efficacy for coping with and managing SCD. The present investigation was designed to extend previous work by assessing the role of disease-specific self-efficacy in the prediction of SCD symptomatology and health-care utilization at multiple time points.

Using a longitudinal, prospective design, we investigated self-efficacy for coping with SCD as a predictor of SCD adjustment at two time points separated by 1 year. We used multiple dependent measures to assess physical and psychological symptomatology as well as behavioral responses to SCD symptoms (ie, health care utilization) to represent the multidimensional construct of adjustment (12, 25, 26). The present study sought to examine (1) the relationships between self-efficacy and SCD adjustment at each time point, (2) the ability of baseline levels of self-efficacy to predict 1-year outcomes, and (3) the relationship between changes in self-efficacy over 1 year and changes in SCD adjustment over that same year. On the basis of the initial findings from our original cross-sectional study (33), as well as the work of Thompson and colleagues (11, 31), we anticipated that self-efficacy would be positively related to adjustment at both time points, that baseline measures of self-efficacy would predict 1-year follow-up adjustment, and that changes in self-efficacy from baseline to follow-up would be positively associated with changes in adjustment over that same period.

METHODS

Patient Sample

Patients were recruited from a regional Sickle Cell Association in Greensboro, North Carolina. Inclusion criteria for the study were 1) age of at least 18 years old and 2) a confirmed positive diagnosis of SCD. Of the eligible clients of the Sickle Cell Association, 147 provided informed consent and completed an extensive psychosocial interview. No information was available regarding individuals who were contacted but did not participate. The data presented in this study concern those 147 individuals who completed baseline assessments and 104 subjects (71% of original sample) who also completed assessments 12 months later. The remaining 43 participants (29% of original sample) were unreachable by phone or mail because of relocation with no forwarding address or disconnection of phone service. All of the research procedures described in the present study were approved by the Sickle Cell Disease Association of the Piedmont's project oversight staff.

Procedure

Potential subjects were contacted by phone by one of two trained nurse interviewers who described the nature of the study and obtained preliminary consent to interview the subjects. After providing written and verbal informed consent, participants were interviewed by one of the nurses. See Edwards et al. (33) for a more detailed description of the study protocol.

Measures

Self-efficacy. Self-efficacy for the perceived ability to engage in daily functional activities despite having SCD was measured with the nine-item SCSES. The SCSES provides an overall index of self-efficacy by summing item scores; higher scores indicate greater self-efficacy. Response categories for each item range from "not at all sure" to "very sure." Please refer to the Appendix for a complete list of items comprising the SCSES. We have documented the reliability and validity of the SCSES in a prior study (33).

SCD adjustment. Disease-specific symptomatology was measured with three indices, composed of a total of 20 items. The first index required patients to rate the severity of their SCD pain for the preceding 30 days along a 10-point Likert scale (1 = no pain to 10 = very severe pain). For the second symptom index, patients rated the frequency of 11 physical symptoms over the preceding 6 months: weakness, yellowing of skin or eyes, vomiting, nausea, pain, heart problems, gall stones, eye trouble, kidney problems, swelling of hands or feet, and shortness of breath. Response categories were 1 = never or rarely (zero or one time), 2 = not very often (two or three times), 3 = often (four or five times), or 4 = very often (six or more times). An overall physical symptom index was created by summing all item scores, with greater scores indicating higher levels of reported physical sympotmatology. Cronbach's alpha for these 11 items was 0.81, which indicates good internal consistency. For the third index, patients rated the frequency of eight psychological symptoms over the preceding 6 months: feeling sad, feeling tense or nervous, feeling short-tempered, feeling worried or concerned, problems coping, problems sleeping, problems eating, and problems paying attention. Response categories for items comprising this index were identical to those described above (ie, 1–4). A total psychological symptom index was calculated by summing responses to all eight items, with higher scores indicating more reported psychological symptomatology. Cronbach's alpha for these items was 0.84, which reveales good internal consistency. Previous studies (4, 8, 31, 33) have used similar measures of physical and psychological symptomatology.

A gross measure of health-care service utilization was assessed with a single item: the number of physician visits in the past 12 months. Previous research with patients who have SCD has indicated that self-report of health care utilization is highly correlated with actual utilization, as documented by medical record review (4).

Data Analysis

First, logistic regression was used to assess predictors of the availability of follow-up data. To determine the cross-sectional associations between self-efficacy scores and SCD adjustment variables at both baseline and 12-month follow-up, Pearson correlations were calculated. To control the type I error rate, only correlations significant at $p < .01$ were interpreted as statistically significant. Temporal stability of the variables employed in the present study was assessed by use of intraclass correlation coefficients, and changes from baseline to 12-month follow-up in self-efficacy and the dependent variables were assessed with repeated-measures analysis of variance. Prospective relationships between self-efficacy scores and changes in SCD adjustment from baseline to 12-month follow-up were investigated by calculating change scores (ie, the baseline value was subtracted from the value of the variable at 1-year follow-up) for each of the variables in the study. Next, we used multiple regression analysis to predict changes in physical symptoms, psychological symptoms, pain severity, and physician visits over the 1-year study period. After controlling for demographic variables (ie, age and gender) and baseline adjustment scores, both baseline SCSES scores and changes in SCSES scores were entered as predictor variables. Again, alpha was set to $p < .01$ to guard against inflation of type I error.

RESULTS

Sample characteristics are summarized in Table 1. A logistic regression analysis was performed that used demographic and study variables to predict the availability of follow-up data. The 104 patients who completed both baseline and 1-year follow-up assessments were coded as 1', and the 43 individuals who completed only the baseline assessment were coded as 2'. Results of this analysis appear in Table 2. Individuals who were lost to follow-up were more likely to be male ($p = .04$). No other study variables predicted the availability of follow-up data.

Temporal Stability

Descriptive data for the SCSES and for all dependent measures at both time points are provided in Table 3. Intraclass correlations between baseline and follow-up scores for the SCSES and all dependent measures were computed. SCSES scores were moderately stable over the 1-year study period ($r = .46$), as were scores

for most dependent measures (intraclass correlations ranging from .37 to .57). Intraclass correlations were significant for all study variables ($p < .01$). Repeated-measures analyses of variance indicated that mean SCSES and dependent variable scores did not change from baseline to follow-up, although individual variability was considerable (Table 3).

TABLE 1. Sample Characteristics ($N = 147$)

Variable	Frequency	%
Age (yr) (mean ± SD: 33.7 ± 12.8)		
18–30	39	26
31–40	62	42
41–50	31	21
51–60	13	9
61–70	2	2
Gender		
Male	62	42
Female	85	58
Employment		
Employed full or part time	69	47
Social security income	57	39
Unemployed/no SSI[a]	21	14
Ethnicity		
African American	146	99
Asian	1	1
Marital status		
Single	103	70
Married	34	23
Divorced or widowed	10	7

[a] SSI, Social Security income.

Zero-Order Correlations Between Self-Efficacy and SCD Adjustment

Table 4 displays the zero-order correlations between self-efficacy and the four dependent variables (pain ratings, physical symptoms, psychological symptoms, and physician visits). SCSES scores were significantly associated with all four of the SCD adjustment variables at baseline and with three of the variables at 12-month follow-up ($p < .01$). At baseline, higher levels of self-efficacy were associated with fewer physical and psychological symptoms, less pain severity, and fewer physician visits. At the 1-year follow-up, higher SCSES scores were significantly related to fewer physical and psychological symptoms and decreased reports of pain severity.

TABLE 2. Results of Logistic Regression Model Predicting Return for Follow-Up Assessment

Variable[a]	Model $R^2 = .13$; $F(8,1) = 2.57$, $p = .012$		
	Standardized Beta	t	Significance
Age	−.14	−1.59	.11
Gender	−.17	−2.06	.04
Baseline self-efficacy (SCSES)	−.10	1.14	.26
Baseline physical symptoms	−.20	−1.63	.11
Baseline psychological symptoms	.07	.58	.56
Baseline pain rating	.11	1.07	.29
Baseline physician visits	−.03	−.27	.79

[a] Physician Visits = number of visits to a physician in the past 12 months; pain rating = reported severity of SCD pain (0–10 scale); physical symptoms = summary score for the Physical Symptom Index (11 items); psychological symptoms = summary score for the Psychological Symptom Index (8 items).

Longitudinal Prediction of SCD Adjustment

Multiple regression analysis was used to determine relationships between self-efficacy and changes in dependent measures from baseline to 1-year follow-up. Specifically, we were interested in whether baseline levels of self-efficacy could predict future changes in symptomatology and health care utilization and whether changes in self-efficacy over the 1-year study period were independently associated with changes in these outcome variables. In separate analyses for each outcome measure, demographic variables (ie, age and gender) and the baseline value of the outcome measure were entered into the multiple regression analysis, with the change in the outcome measure (ie, physical or psychological symptoms, pain ratings, or physician visits) from baseline to follow-up as the dependent variable. Baseline SCSES scores were entered as well, to determine the unique ability of self-efficacy scores to longitudinally predict changes in SCD adjustment. Finally, changes in SCSES scores from baseline to follow-up were also included as predictor variables to examine independent relationships between changes in self-efficacy and changes in the outcome variables.

TABLE 3. Means, Standard Deviations, and Intraclass Correlations for SCSES Scores and SCD Adjustment Measures at Baseline and Follow-up

Measure	Mean		Intraclass Correlation Coefficient*
	Baseline	Follow-up	
Self-efficacy (SCSES)	31.8 (6.9)	30.8 (7.0)	.46
Physician visits	2.8 (5.0)	2.5 (3.6)	.37
Pain rating	5.3 (2.3)	5.1 (3.1)	.41
Physical symptoms	18.6 (5.5)	18.6 (5.1)	.51
Psychological symptoms	13.8 (5.4)	14.4 (5.5)	.57

* $p < .01$.

TABLE 4. Zero-Order Correlations Between Self-Efficacy (SCSES Scores) and SCD Adjustment Variables at Baseline and 12-Month Follow-up

Measure[a]	SCSES Baseline (n = 147)	SCSES Follow-up (n = 104)
Physician visits	−.30*	−.15
Pain rating	−.30*	−.42*
Physical symptoms	−.40*	−.42*
Psychological symptoms	−.38*	−.53*

* $p < .001$.

[a] Physician visits = number of visits to a physician in the past 12 months; pain rating = reported severity of SCD pain (0–10 scale); physical symptoms = summary score for the Physical Symptom Index (11 items); psychological symptoms = summary score for the Psychological Symptom Index (8 items).

The multiple regression analyses revealed that baseline self-efficacy scores were inversely related to changes in physical symptoms (Table 5), psychological symptoms (Table 6), and pain ratings (Table 7) over the 1-year study period. That is, higher baseline self-efficacy was associated with decreases in physical symptoms, psychological symptoms, and pain severity as assessed 1 year later. Moreover, changes in self-efficacy were independently associated with changes in physical symptoms, psychological symptoms, and pain ratings, again in an inverse manner. Increases in self-efficacy from baseline to follow-up were related to decreases in symptomatology over the 1-year study period. Neither baseline self-efficacy nor changes in self-efficacy predicted changes in reported physician visits from baseline to follow-up (Table 8).

DISCUSSION

This study is one of the first systematic investigations of the impact of self-efficacy on short-term and long-term adjustment to SCD. Adults with SCD who reported lower levels of self-efficacy tended to report more physical and psychological SCD-related symptoms, more severe SCD pain, and more frequent physician visits (although this relationship was markedly less robust than relationships between self-efficacy and reported symptomatology) than did those patients who reported relatively greater levels of self-efficacy. Thus, levels of SCD-specific efficacy beliefs related negatively to levels of SCD symptomatology and health-care utilization. Moreover, similar results were observed at both baseline and 12-month follow-up assessments, which highlights the importance of ongoing assessment of efficacy beliefs in the context of a chronic illness such as SCD. These findings are in agreement with previous investigations of self-efficacy beliefs in SCD (9, 31, 33), as well as in other chronic conditions (24, 27, 34, 35).

TABLE 5. Results of Multiple Regression Model Predicting Changes in Physical Symptoms From Baseline to One-Year Follow-Up Assessment (n = 104)

Variable	Model R^2 = .37; $F(5,98)$ = 11.56, $p < .0001$		
	Standardized Beta	t	Significance
Baseline physical symptoms	−.58	−6.59	.001
Age	−.18	−2.18	.03
Gender	.05	.61	.54
Baseline self-efficacy	−.34	−3.46	.001
Self-efficacy change score	−.30	−3.17	.002

Efficacy beliefs were moderately stable over the 1-year study period, as were measures used as outcome variables (physical and psychological symptoms, pain severity, and physician visits). Although several previous studies in patients with fibromyalgia and arthritis (27, 36) appeared to indicate that changes in self-efficacy were a better predictor of outcomes than baseline levels of efficacy beliefs, the present findings suggest that baseline levels of self-efficacy and temporal changes in self-efficacy are uniquely associated with changes over time in SCD symptomatology. After controlling for demographic variables and baseline values of the dependent measures, higher baseline self-efficacy was predictive of decreases in physical symptoms, psychological symptoms, and pain severity over the 1-year study period. Similarly, changes in self-efficacy, independent of baseline levels of self-efficacy, were inversely related to changes in symptomatology from baseline to follow-up. Overall, it seems that individuals with increasing levels of self-efficacy may be at reduced risk for poor SCD adjustment, as indexed by decreased levels of physical and psychological symptomatology. The present findings are somewhat inconsistent with the longitudinal study of psychosocial adjustment to SCD by Thompson and colleagues (9). Their results suggested that baseline efficacy beliefs were not associated with stable positive adjustment over 20 months. However, they did not use a validated disease-specific measure of SCD efficacy beliefs and efficacy was measured at only a single time point (baseline). The current data suggest that 1) self-efficacy beliefs at a single time point are inversely related to SCD symptomatology and health-care utilization; 2) present self-efficacy beliefs may be predictive of future changes in SCD symptomatology, with higher current self-efficacy predicting future decreases in physical and psychological symptoms; and 3) changes in SCD symptomatology are related negatively to changes in self-efficacy over a 1-year period. These results highlight the value of ongoing assessment of self-efficacy beliefs across multiple time points. The mechanisms by which efficacy beliefs might influence physical and psychosocial outcomes remain incompletely understood. Prior investigations have suggested that individuals' efficacy beliefs influence a number of behavioral, cognitive, affective, and physiological variables (25, 37). For example, enhanced efficacy beliefs are associated with diminished perceptions of stress (38), activation of physiological events such as augmented release of endogenous opioids (39), use of more adaptive coping mechanisms (40), decreased anxiety (41), and better adherence to medical regimens

(35). At present, it is not known which, if any, of these and related variables could account for the documented effects of self-efficacy on adjustment to a chronic illness such as SCD.

Bandura (15, 16) emphasizes that self-efficacy expectations are not stable personality traits but are malleable, situation-specific personal beliefs. Sources for self-efficacy beliefs include the individual's perceived and actual performance level, cognitive state, and physical and emotional arousal level. Each of these sources, partially via effects on self-efficacy expectations, can shape adjustment in patients with SCD. By strengthening efficacy beliefs, the physical and psychosocial burden of SCD may be diminished, which ultimately may produce a diminished need for health services, with consequent decreases in direct and indirect treatment costs associated with SCD. A number of individual and group interventions have been shown to produce positive effects on self-efficacy in other populations (27, 35, 41). Moreover, several recent randomized, controlled trials have suggested that brief cognitive, behaviorally oriented counseling may improve patient's self-efficacy and positively affect health outcomes in patients after myocardial infarction (42), patients with arthritis (43), patients with diabetes (44), patients with chronic pain (45), patients recovering from coronary artery bypass surgery (46), patients with fibromyalgia (47), and older adults with macular degeneration (48). In a recent trial that assessed the effects of coping skills training provided via educational videotapes to a sample of patients recovering from coronary artery bypass surgery (46), improvements in self-efficacy in the intervention group were shown to mediate the beneficial effects of the intervention (ie, improved health behaviors and shorter hospital stays).

TABLE 6. Results of Multiple Regression Model Predicting Changes in Psychological Symptoms From Baseline to One-Year Follow-Up Assessment (n = 104)

Variable	Model R^2 = .36; $F(5,98)$ = 10.76, $p < .0001$		
	Standardized Beta	t	Significance
Baseline psychological symptoms	−.58	−6.53	.001
Age	−.01	−.11	.92
Gender	.01	.12	.89
Baseline self-efficacy	−.49	−4.75	.001
Self-efficacy change score	−.40	−4.18	.001

TABLE 7. Results of Multiple Regression Model Predicting Changes in Pain Ratings From Baseline to One-Year Follow-Up Assessment (n = 104)

Variable	Model R^2 = .30; $F(5,98)$ = 8.18, $p < .0001$		
	Standardized Beta	t	Significance
Baseline pain ratings	−.45	−5.16	.001
Age	−.09	−1.04	.30
Gender	−.05	−.59	.55
Baseline self-efficacy	−.36	−3.48	.001
Self-efficacy change score	−.39	−3.93	.001

On the other hand, not all such interventions enhance self-efficacy and improve long-term health outcomes. A recent trial of a self-monitoring intervention in patients undergoing hemodialysis found no difference between treatment and control groups in self-efficacy or physical health (49). In addition, a smoking prevention program in postpartum women did enhance their self-efficacy beliefs relative to the control group but had no effect on smoking status or health outcomes (50). Several other recent trials of psychosocial interventions in pregnant women have indicated no impact of education programs on patients' health behaviors or health outcomes (51, 52). Thus, although a good deal of promising research suggests that brief,

relatively low-cost interventions may enhance patients' self-efficacy beliefs and facilitate health, such positive findings are not universal, and the capacity of a given intervention to promote improved efficacy and better health outcomes may depend on the population in which it is implemented. Although the effects of such interventions have not, to our knowledge, been documented in the population of adults with SCD, future longitudinal studies may wish to implement and study such interventions. Given the availability of interventions that have been demonstrated to enhance self-efficacy, it may be clinically beneficial to identify at-risk individuals low in self-efficacy to reduce adverse SCD impact. Although at least one recent randomized controlled trial found no benefit of additional psychosocial intervention for patients experiencing high levels of distress (53), the intervention employed in that study appeared to be composed of fairly nonspecific phone contacts by social workers. It may be the case that specific interventions targeted at enhancing self-efficacy for coping with chronic medical conditions are necessary to achieve the desired outcomes. Effective, relatively low-cost interventions such as psychoeducational groups, individual counseling, or group therapies (41) may facilitate increased efficacy beliefs and improved adjustment to SCD, thus increasing client and provider satisfaction.

TABLE 8. Results of Multiple Regression Model Predicting Changes in Physician Visits From Baseline to One-Year Follow-Up Assessment ($n = 104$)

Variable	Model $R^2 = .48$; $F(5,98) = 18.18$, $p < .0001$		
	Standardized Beta	t	Significance
Baseline physician visits	−.69	−8.86	.001
Age	−.01	−.08	.94
Gender	−.09	1.19	.24
Baseline self-efficacy	.01	.16	.88
Self-efficacy change score	−.06	−.70	.49

Several limitations of the present study should be noted. First, there was a significant dropout rate, with only 71% of the original participants completing a 1-year follow-up assessment. Although dropout was generally not associated with the measured baseline variables (with the exception that nonreturners were more likely to be male), it is certainly possible that individuals who did not return for follow-up differed from those who did on important but unmeasured variables. Second, the present investigation relied entirely on participant self-report data, the many potential limitations of which have been well-documented (54). Although constructs such as self-efficacy, pain severity, and psychological symptoms such as distress are generally measured by self-report, several of the dependent measures such as the number of physician visits and physical complications of SCD are amenable to more objective evaluation. Future investigations may benefit from inclusion of multiple data sources (eg, behavioral observations, report of family members, medical chart review, etc.). Third, the present study does not identify specific mechanisms for the effects of self-efficacy on SCD symptomatology and adjustment. As indicated above, self-efficacy beliefs may have substantial impact on behavior, physiological processes, or affective states. The present study does not provide an examination of the potential mediators of the effects of self-efficacy. Finally, although the prospective design used in the present study provides evidence of the use of self-efficacy in predicting SCD adjustment, it does not demonstrate causal relevance. An experimental design is necessary to demonstrate a causal role for self-efficacy in facilitating improved SCD adjustment. Investigation of one or more of the interventions suggested above, such as psychoeducational groups, in conjunction with appropriate control groups, would provide a stronger causal demonstration and perhaps a more sensitive estimate of the effects of self-efficacy on SCD adjustment.

This work was supported by the Sickle Cell Disease Association of the Piedmont (J.T.) and Grant MCJ9040 from the Maternal and Child Health Bureau, U.S. Department of Human Services. The authors thank the following individuals, without whose valuable assistance the present work would not have been possible:

Kathy Norcott, Gladys Robinson, Marietta Douglas, Ernestine Bigelow, and Maris Morris for project management and data gathering support. Special thanks to the study participants for volunteering their time to make this study possible.

References:

1. Elander J, Midence K. A review of evidence about factors affecting quality of pain management in sickle cell disease. Clin J Pain 1996; 12: 180–93.
2. Reed W, Vichinsky EP. New considerations in the treatment of sickle cell disease. Annu Rev Med 1998; 49: 461–74.
3. Platt OS, Thorington BD, Brambilla DJ, Milner PF, Rosse WF, Vichinsky E, Kinney TR. Pain in sickle cell disease: rates and risk factors. N Engl J Med 1991; 325: 11–6.
4. McCrae J, Lumley M. Health status in sickle cell disease: examining the roles of pain coping strategies, somatic awareness, and negative affectivity. J Behav Med 1998; 21: 35–55.
5. Reece FL, Smith WR. Psychosocial determinants of health care utilization in sickle cell disease patients. Ann Behav Med 1997; 19: 171–8.
6. Telfair J. Factors in the long-term adjustment of children and adolescents with sickle cell disease: conceptualizations and review of the literature. J Health Soc Policy 1994; 5: 69–96.
7. Gil KM, Abrams MR, Phillips G, Keefe FJ. Sickle cell disease pain: relation of coping strategies to adjustment. J Consult Clin Psychol 1989; 57: 725–31.
8. Gil KM, Abrams MR, Phillips G, Williams DA. Sickle cell disease pain: 2. Predicting health care use and activity level at 9-month follow-up. J Consult Clin Psychol 1992; 60: 267–73.
9. Thompson R, Gil K, Abrams M, Phillips G. Psychological adjustment of adults with sickle cell anemia: stability over 20 months, correlates, and predictors. J Clin Psychol 1996; 52: 253–61.
10. Thompson R, Gil K, Burbach D, Keith B, Kinney T. Role of child and maternal processes in the psychological adjustment of children with sickle cell disease. J Consult Clin Psychol 1993; 61: 468–74.
11. Thompson R, Gustafson K, Gil K, Godfrey J, Murphy L. Illness specific patterns of psychological adjustment and cognitive adaptational processes in children with cystic fibrosis and sickle cell disease. J Clin Psychol 1998; 54: 121–8.
12. Gil KM, Williams DA, Thompson RJ, Kinney T. Sickle cell disease in children and adolescents: the relation of child and parent pain coping strategies to adjustment. J Pediatr Psychol 1991; 16: 643–63.
13. Platt OS, Brambilla DJ, Rosse WF, Milner PF, Castro O, Steinberg MH, Klug PP. Mortality in sickle cell disease: life expectancy and risk factors for early death. N Engl J Med 1994; 330: 1639–44.
14. Telfair J, Myers J, Drezner S. Transfer as a component of the transition of adolescents with sickle cell disease to adult care: adolescent, adult, and parent perspectives. J Adolesc Health 1994; 15: 558–65.
15. Bandura A. Social learning theory. Englewood Cliffs, NJ: Prentice-Hall; 1977.
16. Bandura A. Self-efficacy. Toward a unifying theory of behavioral change. Psychol Rev 1977; 84: 91–215.
17. Buckelew SP, Murray SE, Hewett JE, Johnson J, Huyser B. Self-efficacy, pain, and physical activity among fibromyalgia subjects. Arthritis Care Res 1995; 8: 43–50.
18. Barlow JH, Williams B, Wright C. The generalized self-efficacy scale in people with arthritis. Arthritis Care Res 1996; 9: 189–96.
19. Lackner JM, Carosella AM, Feuerstein M. Pain expectancies, pain, and functional self-efficacy expectancies as determinants of disability in patients with chronic low back disorders. J Consult Clin Psychol 1996; 64: 212–20.
20. Grossman HY, Brink S, Hauser ST. Self-efficacy in adolescent girls and boys with insulin-dependent diabetes mellitus. Diabetes Care 1987; 10: 324–9.
21. Bartholemew LK, Parcel GS, Swank PR, Czyzewski DI. Measuring self-efficacy expectations for the self-management of cystic fibrosis. Chest 1993; 103: 1524–30.
22. Schwartz CE, Coulthard-Morris L, Zeng Q, Retzlaff P. Measuring self-efficacy in people with multiple sclerosis: a validation study. Arch Phys Med Rehabil 1996; 77: 394–8.
23. Wigal JK, Creer TL, Kotses H. The COPD self-efficacy scale. Chest 1991; 99: 1193–6.

24. Patterson J, Blum RW. Risk and resilience among children and youth with disabilities. Arch Pediatr Adolesc Med 1996; 150: 692–8.
25. Rutter M. Resilience. Some conceptual considerations. J Adolesc Health 1993; 14: 626–31.
26. Clark N, Dodge J. Exploring self-efficacy as a predictor of disease management. Health Educ Behav 1999; 26: 72–89.
27. Lorig K, Gonzalez V. The integration of theory with practice: a 12-year case study. Health Educ Q 1992; 19: 355–68.
28. De Boer M, Van Den Borne B, Pruyn J, Ryckman RM, Volovics L, Knegt PP, Meeuwis CA, Mesters I, Verwoerd CD. Psychosocial and physical correlates of survival and recurrence in patients with head and neck carcinoma: results of a 6-year longitudinal study. Cancer 1998; 83: 2567–79.
29. Rodin J, McAvay G. Determinants of change in perceived health in a longitudinal study of older adults. J Gerontol 1992; 47: 373–84.
30. Mannerkorpi K, Ekdakl C. Assessment of functional limitation and disability in patients with fibromyalgia. Scand J Rheumatol 1997; 26: 4–13.
31. Thompson R, Gil K, Abrams M, Phillips G. Stress, coping, and psychological adjustment of adults with sickle cell disease. J Consult Clin Psychol 1992; 60: 433–40.
32. Nunnally JC, Bernstein IH. Psychometric theory. 3rd ed. New York: McGraw-Hill; 1994.
33. Edwards R, Telfair J, Cecil H, Lenoci J. Reliability and validity of a self-efficacy instrument specific to sickle cell disease. Behav Res Ther (Behav Assess) 2000; 38: 951–63.
34. Nicholas MK, Wilson PH, Goyen J. Comparison of cognitive-behavioral group treatment and an alternative non-psychological treatment for chronic low back pain. Pain 1992; 48: 339–47.
35. O'Leary A. Self-efficacy and health. Behav Res Ther (Behav Assess) 1985; 23: 437–51.
36. Buckelew S, Huyser B, Hewett J, Parker JC, Johnson JC, Conway R, Kay DR. Self-efficacy predicting outcome among fibromyalgia subjects. Arthritis Care Res 1996; 9: 97–104.
37. Bandura A. Self-efficacy mechanism in human agency. Am Psychol 1982; 37: 122–47.
38. Bandura A, Cioffi D, Taylor B, Brouillard M. Perceived self-efficacy in coping with cognitive stressors and opioid activation. J Pers Soc Psychol 1988; 55: 479–88.
39. Bandura A, O'Leary A, Taylor B, Gauthier J, Gossard D. Perceived self-efficacy and pain control: opioid and nonopioid mechanisms. J Pers Soc Psychol 1987; 53: 563–71.
40. Major B, Richards C, Cozzarelli C, Cooper M, Zubek J. Personal resilience, cognitive appraisals, and coping: an integrative model of adjustment to abortion. J Pers Soc Psychol 1998; 74: 735–52.
41. Smith RE. Effects of coping skills training on generalized self-efficacy and locus of control. J Pers Soc Psychol 1989; 56: 228–33.
42. Dornelas EA, Sampson RA, Gray JF, Waters D, Thompson PD. A randomized controlled trial of smoking cessation counseling after myocardial infarction. Prev Med 2000; 30: 261–8.
43. Lorish CD, Boutaugh ML. Patient education in rheumatology. Curr Opin Rheumatol 1997; 9: 106–11.
44. Piette JD, Weinberger M, McPhee SJ. The effect of automated calls with telephone nurse follow-up on patient-centered outcomes of diabetes care: a randomized controlled trial. Med Care 2000; 38: 218–30.
45. LeFort SM, Gray-Donald K, Rowat KM, Jeans ME. Randomized controlled trial of a community-based psychoeducation program for the self-management of chronic pain. Pain 1998; 74: 297–306.
46. Mahler H, Kulik JA. Effects of preparatory videotapes on self-efficacy beliefs and recovery from coronary artery bypass surgery. Ann Behav Med 1998; 20: 39–46.
47. Gowans SE, deHueck A, Voss S, Richardson M. A randomized controlled trial of exercise and education for individuals with fibromyalgia. Arthritis Care Res 1999; 12: 120–8.
48. Brody BL, Williams RA, Thomas RG, Kaplan RM, Chu RM, Brown SI. Age-related macular degeneration: a randomized clinical trial of a self-management intervention. Ann Behav Med 1999; 21: 322–9.
49. Tanner JL, Craig CB, Bartolucci AA, Allon M, Fox LM, Geiger BF, Wilson NP. The effect of a self-monitoring tool on self-efficacy, health beliefs, and adherence in patients receiving hemodialysis. J Ren Nutr 1998; 8: 203–11.

50. Ratner PA, Johnson JL, Bottorff JL, Dahinten S, Hall W. Twelve-month follow-up of a smoking relapse prevention intervention for postpartum women. Addict Behav 2000; 25: 81–92.
51. Fraser W, Maunsell E, Hodnett E, Moutquin JM. Randomized controlled trial of a prenatal vaginal birth after cesarean section education and support program. Am J Obstet Gynecol 1997 176; 419–25.
52. Belizan J, Barros F, Langer A, Farnot U, Victora C, Villar J. Impact of health education during pregnancy on behavior and utilization of health resources. Am J Obstet Gynecol 1995; 173: 894–9.
53. Maunsell E, Brisson J, Deschenes L, Frasure-Smith N. Randomized trial of a psychologic distress screening program after breast cancer: effects on quality of life. J Clin Oncol 1996; 14: 2747–55.
54. Brown KW, Moskovitz DS. It's a function of time: a review of the process approach to behavioral medicine research. Ann Behav Med 1998; 20: 109–17.

APPENDIX. The Sickle Cell Self-Efficacy Scale (SCSES)

The following questions ask about how sure you are in dealing day-to-day with sickle cell disease. There are no right or wrong answers, we just want to know what you think. So for each question tell us how sure you are by putting a check in the box that best tells us how you feel. Please answer every question.

1) How sure are you that you can do something to cut down on most of the pain you have when having a pain episode?	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	❒ Very Sure
2) How sure are you that you can keep doing most of the things you do day-to-day?	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	❒ Very Sure
3) How sure are you that you can keep sickle cell disease pain from interfering with your sleep?	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	❒ Very Sure
4) How sure are you that you can reduce your sickle cell disease pain by using methods other than taking extra medication?	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	❒ Very Sure
5) How sure are you that you can control how often or when you get tired?	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	❒ Very Sure
6) How sure are you that you can do something to help yourself feel better if you are feeling sad or blue?❒	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	Very Sure
7) As compared with other people with sickle cell disease, how sure are you that you can manage your life from day-to-day?	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	❒ Very Sure
8) How sure are you that you can manage your sickle cell disease symptoms so that you can do the things you enjoy doing?	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	❒ Very Sure
9) How sure are you that you can deal with the frustration of having sickle cell disease?	❒ Not at all sure	❒ Not sure	❒ Neither	❒ Sure	❒ Very Sure